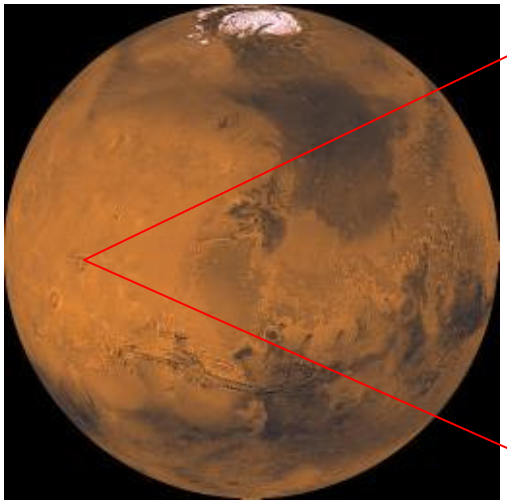
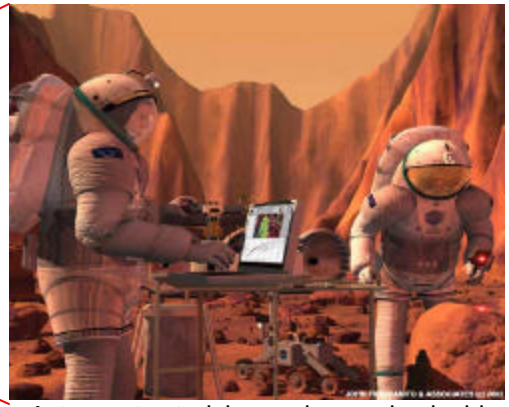
A “Scientific Field Trip” from an Established Manned Mars Base

A Candidate 2004 NASA Academy Group Project





Astronauts studying rock samples inside an extinct volcanic cone on Mars

Assume:

A permanent, but “new” (5 year old) Manned Mars Base from which extended scientific sorties (aka “field trips”) can be done to other locations around Mars.

Time away from the base is always “overnight” and can be days to weeks, including travel time.

This happens in the next 30 years (uses technology only slightly advanced over modern capabilities).

Determine: what capabilities must the base have to support such activities?

ACTIVITIES:

Select the scientific problem to be studied (E.g., search for hydrothermal venting; determine the age of extremely old (or young) terrains, of gullies or episodic fluvial events; find depth to deposits of buried ice; determine composition and age of layered terrains; monitor changes in humidity at the poles with season…) **and the role that men** (vs robots) **would play**.

Determine the location to which the field team must go (Polar regions, ancient river channels, slope or tops of volcanoes, inside or down the walls of canyons or craters), and **how best to get there** (surface or air vehicle? Special requirements on site?).

Specify the goal of the field work, and the work done while on location (collecting rock samples, drilling cores, setting up autonomous instrumentation…).

Design the scientific and support team (functions, skills), **the logistic needs** (power, navigation, communication, habitat…) **and the base, transportation, and supporting infrastructure** (weather monitoring, hazard avoidance…) **needed to accomplish the goals.**

Consider trade-offs: Field crew size, distance traveled, duration on location, duty cycles (“work shifts”) vs logistics (supplies including fuel, air, water, food, scientific equipment.., pre-deployment of supplies vs bringing it along…).

DISCIPLINES INVOLVED:

Geology, Meteorology

Logistics, Transportation

Navigation, Communications

Structural, Mechanical and Electrical Engineering

Information Technology

Astronauts on route to the remote site where extended field work will be done